

Military Space Operations

Joint Pub 3-14

"Doctrine consists first in a common way of objectively approaching the subject; second, in a common way of handling it."

Marshal of France Ferdinand Foch, 1919

Section A. Military Space Operations

1. Overview

a. **The principles of war and how space operations relate to each principle will be discussed in detail in this chapter, along with the operation and employment of space forces, which include the four primary space mission areas: space control, force enhancement, space support, and force application.**

b. Military space operations are an integral part of joint operations. **The importance of space operations is increasing** due to the enabling capabilities they provide the warfighter. Space capabilities are vital to overall military mission accomplishment and provide the advantages needed for success in all joint operations.

The military capabilities provided by space forces should be **integrated and synchronized by the supported commander** into specific joint offensive and defensive operations, campaign planning, and into the concept of operations of their CONPLANs and/or OPLANs and operation orders (OPORDs).

The supported and supporting commanders coordinate, as appropriate, the deployment and employment of space systems and personnel required to receive, process, and disseminate products provided by space forces. For example, space forces may provide missile warning information from space-based surveillance systems, but the supported commander must receive this information, integrate it with information from other warning and surveillance assets, and use the information in support of missile defense operations.

"The Gulf War highlighted areas where both USSPACE COM and supported combatant commanders implemented actions to ensure we take maximum advantage of our Nation's military space systems. ... Space forces were there when required ... theater forces must acquire the equipment and develop the operational expertise necessary to receive, process, act on, and disseminate space data."

**General Charles A. Horner:
Response to Questions
from Senator Sam Nunn, 12 May 92**

Each Service is responsible to develop and maintain a cadre of space expertise. These space operators will be assigned and integrated into theater staffs. This resident space expertise may be further augmented by the assignment of additional personnel (Joint, Army, Navy, Marine Corps, and Air Force) below the theater level to facilitate the use of space systems and provide additional support as required. Theater level space personnel plan, document, and lead theater space integration. Space expertise below the theater level will operate in accordance with theater space support plans.

Space forces normally **support multiple users**, requiring extensive coordination and integration of requirements and capabilities. Support may involve multiple combatant commanders, national agencies, coalition partners, or nonmilitary users. For example, space-based navigation systems (e.g., GPS) not only support military users, but also support civil and commercial users, which may restrict the military's ability to alter system accuracy to affect adversary users. Com-

mander, USSPACECOM will deconflict, prioritize, and synchronize space capabilities in support of other combatant commanders and the Secretary of Defense. The establishing authority for a support relationship will

determine solutions for the supported commander's needs that cannot be fulfilled by the supporting commander.

Section B. Principles of War

2. General

Commanders must consider the following guidelines when planning and executing military operations and requesting space assets and/or capabilities.

a. **Understand how others use space systems** to support military and civilian operations (such as GPS use to support civil aviation).

b. Key in executing military space operations with our coalition partners is their access to information and our systems. In all cases, theater personnel must strive to provide the necessary and appropriate space-related information at the lowest appropriate security classification level. However, established procedures for disclosure of intelligence information (specifically information on US space systems and operations) must be followed in pursuing this goal.

c. Maintain an **awareness** of the supporting space forces and their operational status.

d. Understand how and why space capabilities are **integrated** into military operations.

e. Maintain space **situational awareness** and assess the potential impacts on space-based and ground-based systems and operations.

f. Space support operations, whether conducted by theater or space forces, must be **responsive** and, if possible, tailored to individual joint operations or campaigns.

3. Space and the Principles of War

The needs of the supported commander are the critical factors in conducting space operations. Space capabilities and their products enable the application of the principles of war.

a. **Objective.** Direct every military operation toward a clearly defined, decisive, and attainable objective.

Space forces and application of their capabilities are best employed when they contribute directly to achieving the commander's objectives.

Commanders must understand the **capabilities and limitations** of space support opera-

tions to determine how to best support the joint force, which could include reprioritizing support activities.

The appropriate joint headquarters must ensure that space objectives support the geographic combatant commander's objectives and are included for planning.

b. **Offensive.** Seize, retain, and exploit the initiative.

A high priority for a commander should be to establish **space superiority** (just as air and sea superiority are also essential). The use of space control operations to support freedom of action in space will ensure the ability to provide space capabilities to the warfighter, and deny the opposing force the same.

Global Coverage. With the current on-orbit constellations of military satellites, US ability to rapidly employ forces is greatly enhanced. US forces can seize the initiative with in-place communication, navigation, environmental, ISR, and warning systems to exploit an adversary's weaknesses.

c. **Mass.** Concentrate combat power at the place and time to achieve decisive results.

It is critical for commanders to **integrate and synchronize supporting space forces**, so that the **concentration of combat power at the proper time and place can be most effective**. This conserves available resources, minimizes impact on non-adversaries, and maximizes the effect on the adversary.

Precision navigation capability enables the application of overwhelming force at key points of attack. For example, accurate navigation signals can improve weapon accuracy, thus increasing the probability of kill against fixed targets, minimizing collateral damage and allowing use of advanced stand-off munitions to increase crew survivability.

Synchronization. Space forces also provide a highly accurate time standard, permitting all

units to synchronize their operations and allowing concentration of forces in time and space (geographically and positionally).

d. **Economy of Force.** Allocate minimum essential combat power to secondary efforts.

Space systems and space-based ISR assets can support attainment of **dominant battlespace awareness** to a commander. This reduces uncertainty and permits a reduction in the number and type of forces needed for secondary efforts. Space systems can detect an adversary's movement and support an immediate engagement before its actions can affect the friendly operation.

Precision navigation and smart munitions permit the engagement of targets with the minimum number of weapons needed to achieve the desired effect while minimizing collateral damage. This allows a commander to concentrate forces and apply the combat power at other points in the battlespace.

Other countries may be using the same space systems as an adversary. Identifying these third-parties and understanding their dependency on the use of space systems are necessary to aid decisionmaking in order to **minimize or avoid impact on others**. Agreements with space-faring nations and commercial and international organizations are essential in order to shape the international space community and ensure that potential adversaries are denied needed space capabilities in times of crisis and war.

Space combat operations may impact **friendly forces**. For example, the creation of space debris or jamming actions may impact friendly systems.

Due to the global nature of space systems and the fact that a satellite can be tasked to support several geographic combatant commanders each day, care must be taken to ensure that global and theater requirements are **balanced** and forces appropriately **allocated** to provide combat support based on identified military objectives. However, space forces will be deployed as needed based on requirements.

e. **Maneuver.** Place the adversary in a position of disadvantage through the flexible application of combat power.

Navigation, ISR, weather, and communications support provided by space forces allow units to perform precise, coordinated maneuvers with speed and confidence, even in featureless terrain or under limited visibility.

Blue Force Tracking. GPS and communications provided through space will enhance not only the maneuverability of blue forces but the C2 of these forces throughout the battlespace. Blue force tracking will provide a warfighter with enhanced situational awareness and potentially assist in reducing fratricide.

Maneuvering a satellite could provide additional capabilities to a JFC and place the adversary at a disadvantage through prolonged observation. However, the decision to maneuver a satellite is multifaceted and currently requires **serious deliberation**. Maneuvering a satellite may change its ability to accomplish its current mission; but such a maneuver may be either necessary to optimize mission performance or be required by reprioritization of support to the warfighter. Maneuvers reduce the operational lifetime of the satellite by using its limited fuel. The exact nature of the maneuver is a balance between **expediency** (how quickly the maneuver must be completed) and **mission duration** (reduced by fuel expenditure).

f. **Unity of Command.** Ensure unity of effort under one responsible commander for every objective.

Commander, USSPACECOM is ultimately responsible for the conduct of US military space operations. When space forces are transferred to geographic combatant commanders, care must be given to ensure that space forces are commanded through a single chain of command.

Coordination is necessary when planning and executing space operations. The commander must optimize resources and ensure that actions do not interfere with each other or with the overall campaign plan. Supported JFCs normally designate a single authority to coordinate joint theater space operations and integrate space capabilities.

Prioritize all the space requirements for the AOR to ensure supporting command and supporting agencies have clear guidance on

the supported combatant commander's intent.

Supporting space commanders must have a detailed **understanding** of the **supported commander's ability** to use information and data derived from space capabilities. Additionally, the supporting commander should provide the numbers and type of systems employed, system capabilities, and operational status.

The joint force should **integrate** space capabilities into its planning and operations and should consider the impact if the support is unavailable. To minimize confusion and the misapplication of assets, requests within a theater for space forces should be prioritized and processed applying a theater-wide perspective and by assessing how they satisfy the objectives.

Commander, USSPACECOM and component commanders must provide clear priorities and conflict resolution guidelines in support of contingency and normal operations. Given the changing nature of satellite operations, **supporting commanders must keep abreast of the current priorities and conflict resolution guidelines**. They should identify other users of the same space system and assess the impact of any modification to the use of the system. This information should then be used to adjudicate support conflicts.

The supported commander must be familiar with the process of requesting and receiving space support, and the **adjudication** process should there be conflicts between requirements.

Supporting commanders need **feedback** on how well the support requirements of terrestrial (air, land, sea, and special operations forces) commanders are being met. This will assist the supported commander in planning for follow-on support.

g. **Security**. Never permit the adversary to acquire an unexpected advantage.

The unique advantages of global coverage, wide fields of view, and the capability to re-

visit targets make observation of the Earth from space a powerful tool. Space forces can have access to any point on Earth, and proper management of satellite orbits and constellations offers overflight flexibility. This enhances the supported commander's ability to observe the AOI and increase battlespace awareness, **reducing the commander's uncertainty**.

Know the adversary and understand the adversary's access to, use of, and dependency on space systems. Since space technology is widely available through commercial sources, commanders must understand what technology is at an adversary's disposal and how well it may be used by US opponents. Commanders must also be familiar with the **threat** to US systems and be able to protect these systems by minimizing or eliminating the threat and implementing protection measures as appropriate.

Know the environment. Observations and forecasts of the natural space and atmospheric environments are crucial to maintaining battlespace awareness and contribute directly to space superiority. This awareness allows friendly forces to mitigate weather impacts on US space and terrestrial systems and exploit impacts on adversary systems.

h. **Surprise**. Strike the adversary at a time or place or in a manner for which it is unprepared. Surprise is closely linked to security, since security measures are often needed to achieve the element of surprise. Space operations contribute to the element of surprise by providing timely intelligence, enhanced information sharing, and precision targeting, allowing the joint force to achieve success well out of proportion to the effort expended. Space control operations can foil the adversary's ability to determine US intentions through the use of space-based ISR, allowing us to maintain the element of surprise.

i. **Simplicity**. Prepare clear, uncomplicated chains of command, lines of coordination, plans, and concise orders to ensure thorough understanding. Every effort should be made to ensure that space operations are clearly understandable to everyone participating in the operational area.

Section C. Space Mission Areas

4. Space Control Mission Area

a. **General.** Space control operations provide freedom of action in space for friendly forces while, when directed, denying it to an adversary, and include the broad aspect of protection of US and US allied space systems and negation of adversary space systems. Space control operations encompass all elements of the space defense mission. Space control may involve activities conducted by land, sea, air, space and/or special operations forces. To gain space superiority, space forces must surveil space and terrestrial AOs that could impact space activities, protect the ability to use space, prevent adversaries from exploiting US, allied, or neutral space services, and negate the ability of adversaries to exploit space capabilities. These forces would be brought to bear against space systems or facilities identified through the targeting process. Space control operations will provide freedom of action in space for friendly forces and, when directed, deny the same freedom to the adversary. They include offensive and defensive operations by friendly forces to gain and maintain **space superiority** and **situational awareness** of events that impact space operations.

b. **Missions.** Space control operations include surveillance of space, protection, prevention, and negation functions (see Figure IV-1). These opera-

tions change in nature and intensity as the type of military operations changes. Prevention efforts can range from deterrence or diplomacy to military action. If prevention efforts fail, protection and negation functions may be performed to achieve space superiority. Negation focuses on denying an adversary's effective use of space. Prevention, protection, and negation efforts all rely on the ongoing surveillance of space and Earth to make informed decisions and to evaluate the effectiveness of their efforts. A space control matrix is shown in Figure IV-2.

Surveillance of Space. Situational awareness is fundamental to the ability to conduct the space control mission. It requires: robust space surveillance for continual awareness of orbiting objects; real-time search and targeting-quality information; threat detection, identification, and location; predictive intelligence analysis of foreign space capability and intent in a geopolitical context; and a global reporting capability for friendly space systems. Space surveillance is conducted to detect, identify, assess, and track space objects and events to support space operations. Space surveillance is also critical to space support operations, such as placing satellites in orbit. Further, space situational awareness data can be used to support terrestrially-based operations, such as reconnaissance avoidance and missile defense.

Protection. Active and passive defensive measures ensure that US and friendly space systems perform as designed by overcoming an adversary's attempts to negate friendly exploitation of space or **minimize adverse effects** if negation is attempted. Such measures also provide some protection from space environmental factors. Protection measures must be consistent with the criticality of the mission's contribution to the warfighter and are applied to each component of the space system, including launch, to ensure that no weak link exists. Means of protection include, but are not limited to,

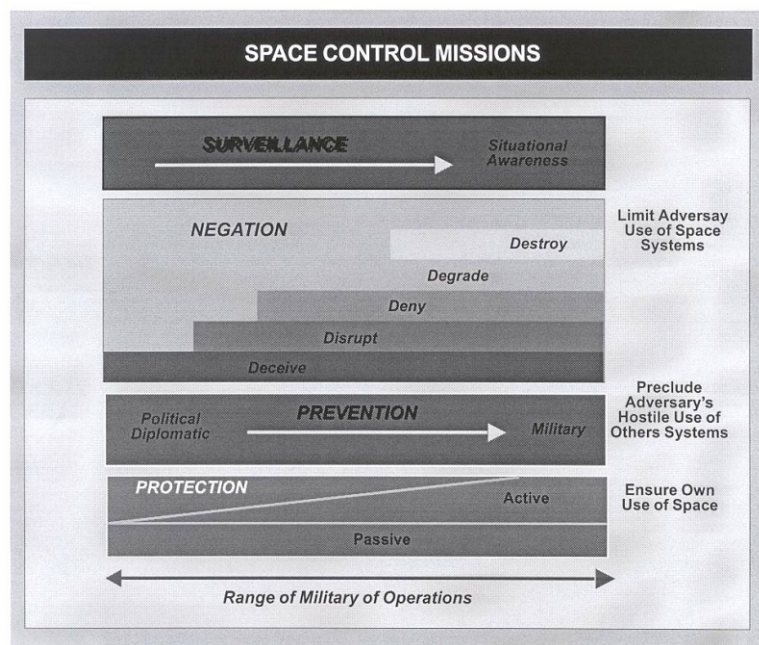


Figure IV-1. Space Control Missions

ground facility protection (security; covert facilities; camouflage, concealment, and deception; mobility), alternate nodes, spare satellites, link encryption, increased signal strength, adaptable waveforms, satellite radiation hardening and space debris protection measures. Furthermore, the system of protection measures should provide unambiguous indications of whether a satellite was under attack or in a severe space weather environment when any satellite anomaly or failure occurs. Finally, attack indications could be so subtle or dispersed that individually, an attack is not detectable. At a minimum, a common fusion point for possible indications from all USG satellites should be provided to allow centralized analysis.

Prevention. Measures to preclude an adversary's hostile use of US or third party space systems and services. Prevention can include military, diplomatic, political, and economic measures as appropriate.

Negation. Measures to **deceive, disrupt, deny, degrade, or destroy** an adversary's space capabilities. Negation can include action against the ground, link, or space segments of an adversary's space system.

Deception. Measures designed to **mislead** the adversary by manipulation, distortion, or falsification of evidence to induce the adversary to react in a manner prejudicial to their interests.

Disruption. **Temporary impairment** (diminished value or strength) of the utility of space systems, usually without physical damage to the space system. These operations include the delaying of critical, perishable operational data to an adversary.

Denial. **Temporary elimination** (total removal) of the utility of an adversary's space systems, usually without physical damage. This objective can be accomplished by such measures as interrupting electrical power to the space ground nodes or computer centers where data and information are processed and stored. For example, denying US adver-

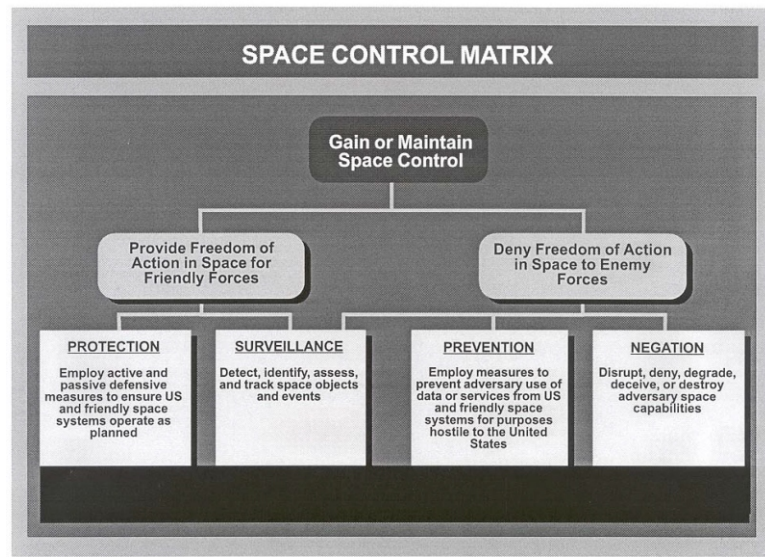


Figure IV-2. Space Control Matrix

saries position navigation information could significantly inhibit their operations.

Degradation. **Permanent partial or total impairment** of the utility of space systems, usually with physical damage. This option includes attacking the ground, control, or space segment of any targeted space system. All military options, including special operations, conventional warfare, and information warfare are available for use against space targets.

Destruction. **Permanent elimination** of the utility of space systems. This last option includes attack of critical ground nodes; destruction of uplink and downlink facilities, electrical power stations, and telecommunications facilities; and attacks against mobile space elements and on-orbit space assets.

5. Space Force Enhancement Mission Area

a. **General.** Force enhancement operations **multiply joint force effectiveness** by enhancing battlespace awareness and providing needed warfighter support. There are five force enhancement functions: ISR; integrated tactical warning and attack assessment; environmental monitoring; communications; and position, velocity, time, and navigation. They provide significant advantage by reducing confusion inherent in combat situations. They also improve the lethality of air, land, sea, space, and special operations forces. Force enhancement functions are also often provided by agencies such as NRO, NSA, NIMA, Na-

tional Aeronautics and Space Administration, NOAA, commercial organizations, and consortiums. Appendices A through E discuss the space force enhancement functions in greater detail.

b. Missions

ISR. Monitoring terrestrial (air, land, and sea) AOIs from space helps reveal location, disposition, and intention at the tactical, operational, and strategic levels of war. Such information provides warning of attack, operational combat assessment, tactical battle damage assessment (BDA), and feedback on how well US forces are affecting the adversary's understanding of the battlespace. ISR support is requested through established collection management channels within the intelligence community. Dissemination down to user warfighter level must be timely and assured.

Integrated Tactical Warning and Attack Assessment. Satellite- and ground-based systems are crucial for providing timely detection and communicating warning of an adversary's use of ballistic missiles or nuclear detonations (NUDETs) to US strategic forces, tactically deployed forces, and US allies. ITW/AA is a composite term in satellite and missile surveillance. Tactical warning is a notification to operational command centers that a specific threat event is occurring. The component elements that describe threat events are: **Country of origin**—country or countries initiating hostilities; **Event type and size**—identification of the type of event and determination of the size or number of weapons; **Country under attack**—determined by observing trajectory of an object and predicting its impact point; and **Event time**—time the hostile event occurred. Attack assessment is an evaluation of information to determine the potential or actual nature and objectives of an attack for the purpose of providing information for timely decisions.

Environmental Monitoring. Space forces provide data on meteorological, oceanographic, and space environmental factors that might affect operations in other battlespace dimensions. Additionally, space forces provide forecasts, alerts, and warnings of conditions in space. Imagery capabilities such as MSI can provide joint force planners with current information on surface con-

ditions such as surface trafficability and beach conditions, vegetation, and land use. Knowledge of these factors allows forces to avoid adverse environmental conditions (such as poor surface conditions or severe weather), while taking advantage of other conditions to enhance operations. Such monitoring also supports IPB by providing the commander with information needed to identify and assess potential adversary COAs.

Communications. Space-based communications offer many unique advantages that allow the JFC and subordinate commanders to shape the battlespace. Using military satellite communications and, in some cases, civil, commercial, and international systems, the JFC and subordinate commanders can execute reach-back operations, draw from planning support databases in the continental United States, sustain the two-way flow of data, and disseminate plans, orders, and force status over long distances, increasing C2 effectiveness, especially in areas with limited or no communications infrastructure. Satellite communications provide critical connectivity for maneuver forces whose rapid movement and non-linear deployments take them beyond inherent LOS communication networks.

Position, Velocity, Time, and Navigation. Space forces provide precise, reliable position and timing information that permits joint forces to more effectively plan, train, coordinate, and execute operations. Space-based blue force tracking will improve C2 of assets and provide enhanced situational awareness while decreasing the chances of fratricide.

The **NAVSTAR GPS** provides the primary space-based source for US and allied position, velocity, and timing requirements. Certain ground-based systems, primarily allied equipment, also utilize similar information from the Russian Glonass satellite constellation. This information enables precise location, velocity, and timing for such uses as navigation of terrestrial forces, combat identification, and target weaponeering for some precision munitions. Limitations: Like communications satellite uplinks and downlinks, GPS signal is also susceptible to hostile jamming and spoofing. Additionally, satellite in-

formation is only as accurate as the information uploaded to satellites. As such, errors in position, timing, and velocity can be induced into the downlinked information by uploading erroneous information to the satellite. Current satellite systems require continual monitoring and routine uploading of information in order to ensure accurate terrestrial position, velocity, and timing.

"The war with Iraq was the first conflict in history to make comprehensive use of space systems support. All of the following helped the Coalition's air, ground, and naval forces: The DMSP [Defense Meteorological Support Program] weather satellites; US LANDSAT [land satellite] multi-spectral imagery satellites; the GPS; DSP early warning satellites; the tactical receive equipment and related applications satellite broadcast; the Tactical Information Broadcast Service; as well as communications satellites."

**DOD Report to Congress,
Conduct of the Persian Gulf War, Apr 92**

6. Space Support Mission Area

a. **General.** Space support operations consist of operations that launch, deploy, augment, maintain, sustain, replenish, deorbit, and recover space forces, including the C2 network configuration for space operations.

b. **Functions.** Support operations to space forces consist of **spacelift**, satellite operations (**telemetry, tracking and commanding (TT&C)**), and deorbiting and recovering space vehicles, if required.

Spacelift. Spacelift is the ability to deliver satellites, payloads, and material into space. Spacelift operations are conducted to deploy, sustain, or augment satellite constellations supporting US military operations. During periods of increased tension or conflict, a spacelift objective is to launch and deploy

new or replacement space assets and capabilities necessary to maintain, augment, or add to the operational capability of space systems to achieve national security objectives. This requires responsive, affordable launch capabilities.

Satellite Operations. Satellite operations are conducted to maneuver, configure, and sustain on-orbit forces, and to activate on-orbit spares. Military satellite operations are executed through a host of dedicated and common-user networks. The Air Force operates the Air Force Satellite Control Network for common use satellite operations. The Naval Satellite Control Network provides satellite operations of communications, oceanographic and research satellites and packages in support of all joint warfighters. Several systems utilize dedicated antennas for both mission data retrieval and routine satellite TT&C. The various networks combined ensure total C2 of space resources.

Reconstitution of Space Forces. Reconstitution refers to plans and operations for replenishing space forces in the event of loss of space assets. This could include repositioning and reconfiguring surviving assets, augmentation by civil and commercial capabilities and replacement of lost assets.

7. Space Force Application Mission Area

The application of force would consist of attacks against terrestrial-based targets carried out by military weapons systems operating in or through space. The force application mission area includes ballistic missile defense and force projection. Currently, there are no force application assets operating in space.